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10/790,700	03/03/2004	Kwang Woon Lee	1594.1337	4282

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EXAMINER	
LEYKIN, RITA	

ART UNIT	PAPER NUMBER
2837	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/790,700	LEE, KWANG WOON	
	Examiner	Art Unit	
	Rita Leykin	2837	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-20 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-7, 9-11, 13,-14, 16-18,20 is/are rejected.

7)☒ Claim(s) 8,12,15 and 19 is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date 07/24/07.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1, 3, 5, and 14 are rejected under 35 U.S.C. 102(b) as being anticipated by Tojo et al. US # 5,980211.

With respect to **claims 1, 3, 5** Tojo et al. disclose:

- A linear compressor driving apparatus, wherein a piston is reciprocating by a drive motor, (see title);

In Fig. 1 Tojo et al. show a structure for a driving apparatus 2 , wherein the structure includes a power source 3 to provide driving current to linear motor of the linear compressor 1, a current sensor 4 for detection of actual current value Inow, a position sensor 5 and a control apparatus 6;

The control apparatus 6 outputs a control signal to power source 3, based on detected current value and Inow and detected position present value Pnow, detected by the position sensor 5.

Tojo et al. teach several different embodiments, wherein based on detected speed/position a current instruction (reference) value is determined. These embodiments could be found for instance in Fig. 1 and Fig. 5, wherein Tojo et al. teach a current subtracter 36, that calculates difference between Iref value and Inow value

and applies the result of calculation to the current control portion 37, (see col. 7, lines 35-40).

With respect to claimed "phase difference", based on displacement waveform of the piston, in col. 18, lines 18-22 Tojo et al. teach that phase difference between current position instruction value Pref and position present value Pnow may be detected and frequency of the position value instruction value Pref may be controlled such that the phase difference attains 90 degrees.

With respect to **claim 5**, in addition to above discussed limitations Tojo et al. also teach:

- A position instruction unit, interpreted as claimed displacement/speed detection unit to generate a waveform of the piston based on the value detected by position (displacement) sensor, (see Fig. 29 and col. 20, lines 59-63).

With respect **to claim 6**, in addition to above discussed limitations Tojo et al. also teach in Fig. 30 and col.21, lines 11- 15:

- A DC power source 101that outputs a prescribed DC voltage E to inverter 102.

Inverter 102 is PWM-controlled by current control portion 109 of control apparatus 105, and converts the DC voltage E to an AC voltage e of the resonance frequency, and applies it to linear compressor 80.

With respect **to claims 2, 4,** Tojo et al. also teach setting upper dead point side amplitude as maximum amplitude and setting of lower dead point side amplitude as

maximum amplitude. In step S78, current gain Gi is controlled and set such that the maximum amplitude present value Anow matches the maximum amplitude target value Aref by current gain control portion 66, (see Fig. 18, units 64, 66, 67 and Fig. 19, steps S72-S78 and col. 14, lines 18-44, col. 16, lines 54 – col. 17, lines 1-16);

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 7, 14 are rejected under 35 U.S.C. 102(b) as being anticipated by Ueda et al. US 2001/0005320.

Ueda et al. disclose a linear compressor driving device with piston in a cylinder. Wherein, Ueda et al. show in Fig. 1 and 2:

- A current amplitude determining means 2;
- A drive frequency determining means 4;
- An input current waveform commanding means 3.

In [0185] Ueda et al. teach that variation in the resonance frequency is arising from a variation in the load and can be followed to increase the efficiency of the linear compressor.

- A voltage detection means 10 having an output to inverter power output calculation means 11;
- A current detection means 8, coupled with inverter output power calculating means 11;
- A drive frequency determining means 4;
- An input current waveform commanding means 3 that coupled with above devices.

In Fig. 1-3, Ueda et al. teach current amplitude value determining means 2 and adjustment of current amplitude according to frequency variation in order to maximize the power input to the compressor, see [0105]- [0121]. By maximizing the supply power amplitude, Ueda et al. maximizing With respect to claim 11, limitations similar to claims 1, 3, 5 and 9 have been discussed in the paragraph above. Tojo et al. teach in Fig. 18 upper and lower dead points detection portion 64 coupled with amplitude neutral position control portion 67. Tojo et al. teach voltage detection unit and maximizing linear compressor input power.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 9, 10, 11, 13, 16, 17, 18 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tojo et al. US # 5,980211 and Ueda et al. US 2001/0005320. With respect to claims 9 and 11, Ueda et al. teach:

- A DC power supply output 5 and inverter 6, wherein it is inherent to Ueda et al. teaching that DC power supply 5 could be a converter;
- The inverter 6 outputs AC power supply to linear compressor motor 1;
- A current detecting device 7 to detect current supplied to the motor and coupled to a current detecting means 8;
- A voltage detecting means 10 to detect voltage supplied to the motor;

Ueda et al. do not teach an amplitude control unit to set maximum amplitude of drive current to control the motor so that top and bottom dead centers of the piston satisfy top and bottom commands received from an outside of the linear compressor. However, Tojo et al. teach in Fig. 1, 3, 18:

- A position instruction value amplitude control portion. The position instruction value amplitude control portion 60 is coupled to current instruction value generating portion 62.
- Tojo et al. also teach setting upper dead point side amplitude as maximum amplitude and setting of lower dead point side amplitude as maximum amplitude. In step S78, current gain Gi is controlled and set such that the maximum amplitude present value Anow matches the maximum amplitude target value Aref by current gain control portion 66, (see Fig. 18, units 64, 66,

67 and Fig. 19, steps S72-S78 and col. 14, lines 18-44, col. 16, lines 54 – col. 17, lines 1-16);

- Claimed phase control unit to generate reference waveform in which reference waveform has difference 90 degrees, based on displacement waveform of the piston, is presented in col. 18, lines 18-22, wherein Tojo et al. teach that phase difference between current position instruction value Pref and position present value Pnow may be detected and frequency of the position value instruction value Pref may be controlled such that the phase difference attains 90 degrees;
- Generation of reference current according to amplitude information and phase and frequency shown in Fig. 4, in steps S1, S5-S7, (see col. 7, lines 55-67, col. 8, lines 1-27).

Hence, it has been obvious to one of ordinary skills in the art, at the time invention was made to combine teaching of Tojo et al. and Ueda et al. to control driving apparatus for a linear compressor with a reciprocation piston to adjust motor current amplitude based on change in piston position and according to variations in the applied to motor load.

The reason is to increase motor efficiency by controlling motor current amplitude according to piston current resonance frequency.

Allowable Subject Matter

7. Claims 8, 12, 15 19 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rita Leykin whose telephone number is (571)272-2066. The examiner can normally be reached on Monday-Friday 8:00-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lincoln Donovan can be reached on (571)272-1988. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Rita Leykin
Primary Examiner
Art Unit 2837

R.L.